Smart Wind Generation System

**B.Yaswanth Kumar, A.Sai Swaroop, K.Sai Charan, G.Tabitha**

Abstract: This paper proposes a wind generation system by tracking the maximum wind direction by using air sensors. This wind generation system equipped with the Permanent Magnet Synchronous Generator (PMSG) connected to the Grid. Diode Rectifier, Boost converter, Neutral Point Clamped inverter (NPC) are used as a interfacing devices between PMSG and Grid. This method has plentiful features like low and medium power wind generation applications. It is also very less in cost and high efficient due to tracking the maximum wind direction and rotating itself into that direction.

Keywords: Boost converter, Permanent Magnet Synchronous Generator (PMSG), Diode Rectifier, Neutral Point Clamped inverter (NPC) .

I. INTRODUCTION

The people across the globe are suffering with the lack of electricity generation. The main reason for the lack of power generation is distinction of the fossil fuels like coal, petrol etc. So that the world is going to search for the best alternative sources. In that renewable energy generation, wind energy is one of the precious energy that can be available in the world. In the world more number of people .Wind mills consist of a number of wind turbines which are connected to a power generation network. The overseas air is stronger than in fields and farms, but the cost of construction and maintenance is high. Air is a powerful source of energy, which can generate high electricity and can supply in demand. As the wind power in the region increases, other rces of energy are used to support it and the grid has to be upgraded. Nearly 83 countries are using wind energy to provide electricity. Wind power is another great source in the world. It is a best source of renewable energy sources. But the wind direction is not constant and does not go in the same way every day or everywhere and the efficiency of wind generation is also very low compared to other non-renewable energy sources. In order to design a reproductive system of air that can move around on its own it goes through the air. This will help improve the efficiency of the air cooler.

II. BLOCK DIAGRAM
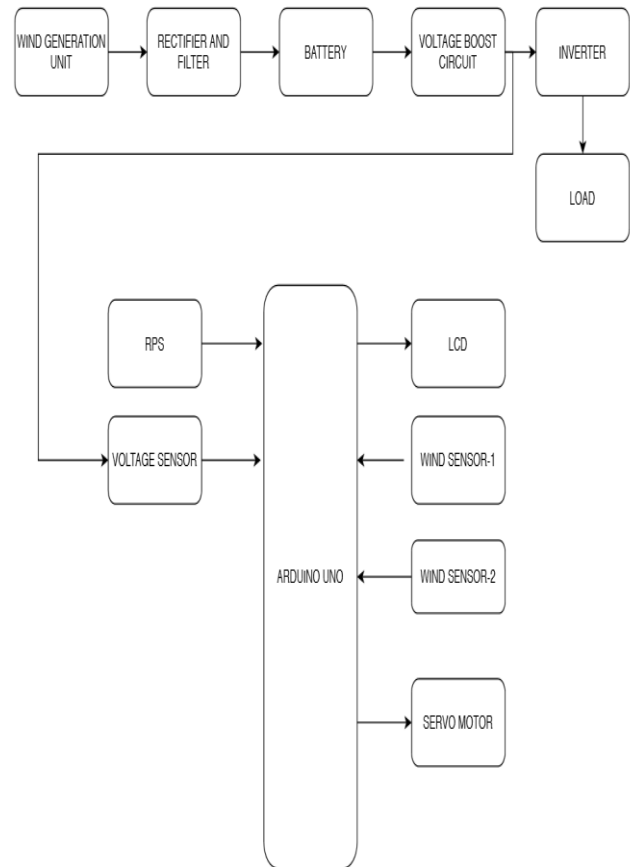
The wind source is taken as input and is going to use as supply. There is going to be use of rectifier which is going to rectifies the wind energy and the output energy is stored in a battery. For getting more amount of energy there is an usage of boost converter to boost up the voltage. The voltage supplied is converted from ac to dc by using an inverter. After that for getting result supply to the load. In the process an arduino is used for sensing in which direction the wind is high. After sensing by using the turbine is turned to high wind direction.

III. HARDWARE COMPONENTS

1. ARDUINO UNO

Arduino Uno is a microcontroller. It basically depends on ATMEGA328P. It contains both digital and analog pins, which can be used as both input/output. The input pins are provided with sensors. The computation and logics can be developed in the form of a code and is compiled and uploaded to the Arduino UNO board in an Arduino IDE(which is an open source software).

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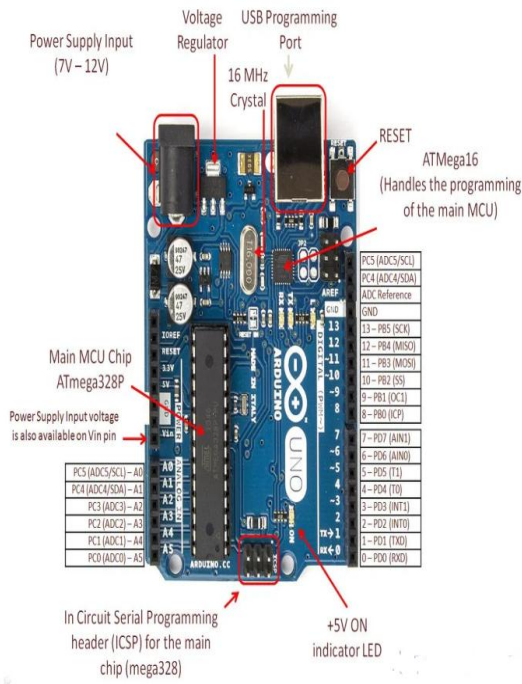
Smart Wind Generation System

Fig:Arduino UNO

2.BRIDGE RECTIFIER

Actually rectifier is nothing but the conversion of AC supply to DC supply. Bridge rectifier consists of full wave rectification. The current flows in only forward direction in a bridge rectifier in a series components during positive part of AC cycle and flows in the reverse direction in the negative part of the cycle.
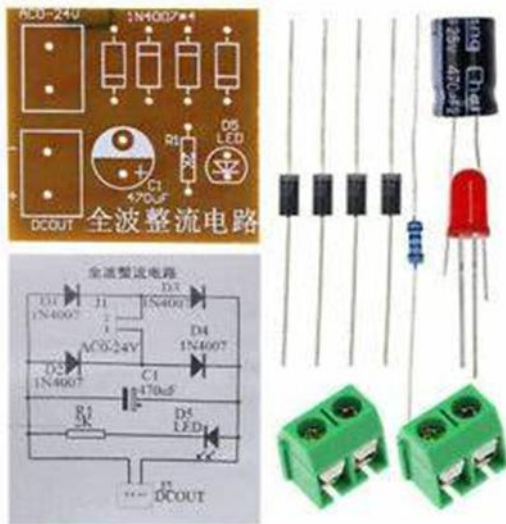

Fig: Bridge Rectifier

3. BOOST CONVERTER

Actually the booster is used to step up the voltage. The boost converter converts the DC to DC voltage which is greater than the source voltage. The booster step up the voltageit to the load at a higher voltage. Actually the rating is of 5v that is going to be uses.

Fig: Booster

4.AIR SENSORS

Air sensors are mainly used to measure the flow of air. The sensors are used to set get the result in which direction the pressure is high. The sensors help us to sense the more amount of air.

Fig: Air Sensors

5. LCD DISPLAY

A 16x2 LCD display is used to display source current and load current and also for displaying alert when the theft is detected.
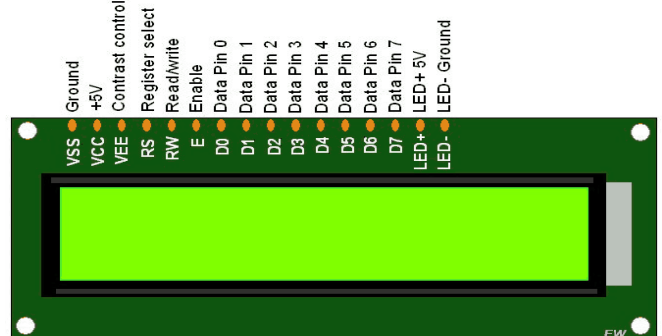

Fig:LCD Display

6. BRUSH LESS DC GENERATOR

DC motors has soft iron core , so will generate nominally zero voltage when spun. The brushless DC generators have permanent magnet rotors.

Fig: DC Generator

7. VOLTAGE SENSOR

Actually voltage sensor is used for detecting the more amount of voltage is generated or supplied to the circuit.

If that happens the voltage sensor send a signal of needed voltage is supplied. The remaining voltage is stored in a battery connected in the circuit.
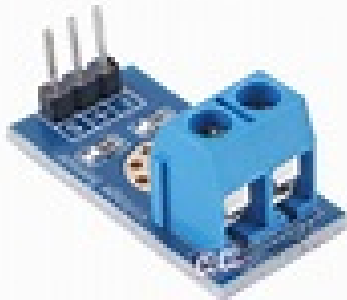

Fig: Voltage Sensor

IV. OPERATION

This wind generation system consists of a PMSG generator, Diode Rectifier, Boost Converter, Voltage sensors, Wind sensors, Arduino and servo motors. The speed of the wind is calculated by the wind sensors and it compares value between the two sensors from the two directions. By comparing the values it send the output to the servo motor and the servo motor rotates to the maximum wind direction.

After that, due to the maximum wind the PMSG wind turbine starts rotating at this case the wind energy is change into the rotational kinetic energy. Generator converts rotational kinetic energy into mechanical energy and from mechanical energy to electrical energy. The generated energy is send to the rectifier circuit to convert AC power into DC power. Converted DC power is stored in the Battery. Power from the battery is sent to the boost converter; the boost converter boosts the power and sends it to the voltage sensor and inverter. The voltage sensor measures the voltage value in the circuit and displays it on the LCD. The inverter converts DC power to AC and sends to the Grid.

Arduino is interfacing with the voltage sensor, wind sensors, LCD and to the boost converter. The main process is takes place at the UNO only because it compares the maximum wind direction and sends output to the servo motor which can be able to rotate the maximum wind direction. The operation of the Neutral Point Clamped Inverter is quite easy when compared to the normal inverter. It has the multi level operations; according to our purpose we use those levels. In our circuit we use only two levels because that is enough for this type of low level generation units.
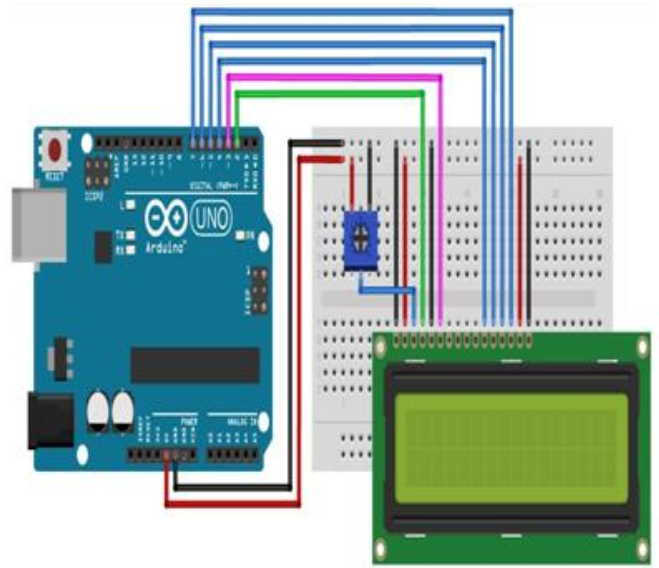

Fig: Interfacing LCD with Arduino

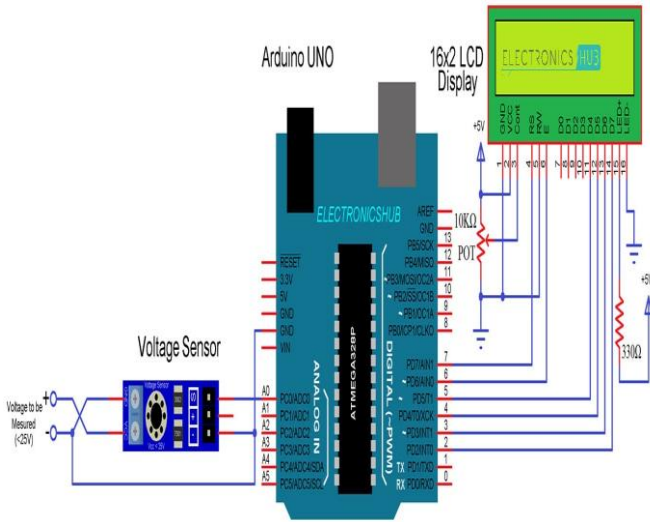**Fig: Interfacing wind sensor with Arduino**

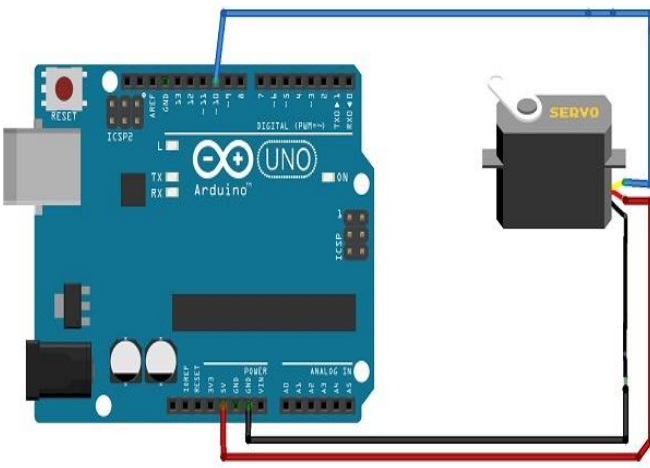**Fig: Interfacing voltage sensor with Arduino**

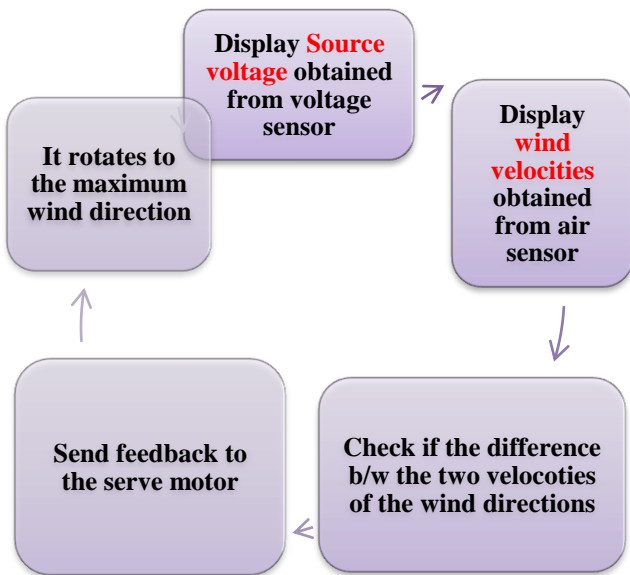
Fig: Interfacing servo motor with Arduino

Fig: Flowchart for LCD display operation

V. RESULTS

The results are obtained when an illegal load is connected. Soon after the theft is detected, buzzer turned ON, LCD displayed the theft alert, and power theft location has been sent to the authorities`by the GSM module. Along with that alerts are sent to consumers regarding power bill based on their power consumption.
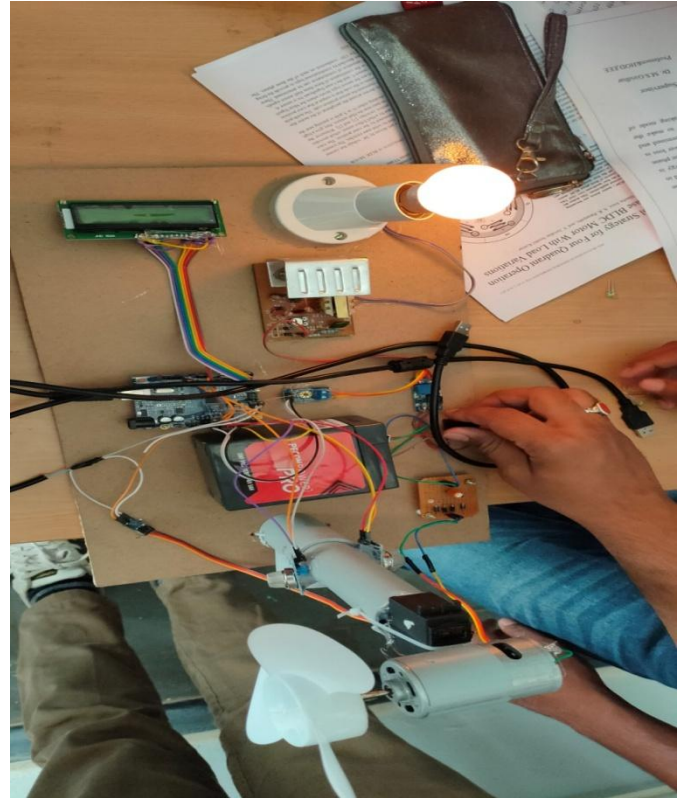

Fig: Design of proposed system

VI. CONCLUSION

The proposed system can be able to rectify problems like wind generation and proper usage of wind energy. It can be able rotate itself to maximum wind direction and it helps to increase the total efficiency of wind power generation system. Benefits to the service providers and government and other DISCOMs can prevent their losses by taking immediate actions by developing this kind of latest advanced technology.

REFERENCES

1. Shi Q, Wang G, Fu L, Yuan L, Huang H (2013) State-space averaging model of wind turbine with PMSG and its virtual inertia control. In: IECON 2013–39th annual conference of the IEEE, Industrial Electronics Society, pp. 1880–1886
2. Martins M, Perdana A, Ledesma P, Agneholm E, Carlson O (2007) Validation of fixed speed wind turbine dynamic models with measured data. Renew Energy 32(8):1880–1886
3. Pagola V, Peña R, Segundo J (2015) Low voltage ride-through analysis in real time of a PV-Wind hybrid system. In: 2015 IEEE international autumn meeting on power, electronics and computing (ROPEC), pp 1–6
4. Tobías A, Peña R, Morales J, Gutierrez G (2015) Modeling of a wind turbine with a permanent magnet synchronous generator for real time simulations. In: 2015 IEEE international autumn meeting on power, electronics and computing (ROPEC).
5. Power Electronics Converters for Wind Turbine Systems, F. Blaabjerg, M. Liserre and K. Ma.
6. https://www.circuitdigest.com.
7. https://en.wikipedia.org.
8. Smart Wind Generation System, researchgate.net

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